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JC955 U.S. PTO

Customer No. 000959

Case Docket No. SMQ-038

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Box Patent Application
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JC932 U.S. PTO
09/04/99
11/01/00

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Transmitted herewith for filing is the patent application of

Inventor(s): Robert P. St. Pierre

For: System And Method For A Priority Messaging Protocol For A Shared Display Device

Enclosed are:

- ☐ This is a request for filing a ☐ continuation ☐ divisional application under 37 CFR 1.53(b), of pending prior application serial no. _____ filed on _____ entitled _____.
- ☒ 1 cover page.
- ☒ 10 pages of specification, 6 pages of claims, 1 pages of abstract.
- ☒ 14 sheets of drawings.
- ☒ A Declaration, Petition and Power of Attorney.
- ☒ An assignment of the invention to SUN MICROSYSTEMS, INC. A recordation form cover sheet (Form PTO 1595) is also enclosed.
- ☐ A verified statement to establish small entity status under 37 C.F.R. 1.9 and 37 C.F.R. 1.27.
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United States Application

Entitled: SYSTEM AND METHOD FOR A PRIORITY MESSAGING
PROTOCOL FOR A SHARED DISPLAY DEVICE

Inventors: Robert P. St. Pierre

0970443-10100

SYSTEM AND METHOD FOR A
PRIORITY MESSAGING PROTOCOL
FOR A SHARED DISPLAY DEVICE

5 Technical Field

The present invention relates generally to the display of messages from multiple electronic devices by a network connected display device, and more particularly, to a priority based messaging protocol facilitating the sharing of a single display device by multiple electronic devices connected to a network.

10

Background of the Invention

Electronic devices connected to a network often display data to a user. Customarily, this is done by sending the information to a display device where the data is displayed. This approach works well when the display device is dedicated to a single application/device. Problems arise, however, when multiple devices are forced to share a single display surface.

15

Currently, there are two main approaches to allowing multiple network devices to share a single display device. In the first approach, multiple network devices share a single display device by partitioning the display surface into separate discrete areas. Each discrete area becomes dedicated to a single device. The result of such an approach is that each device has less available display surface dedicated to the device. For example, in a car, the display surface might be divided to show a gas indicator, a mile per hour indicator, a tachometer, a headlight indicator, and a warning gauge. Splitting the display surface in such a manner reduces the size of the information that is displayed for any device, and a driver viewing the display surface is required to focus harder in order to see any particular item. Another approach is to allow information from a device to overwrite the previous information that is displayed for another device. Thus, for example, information from the cd player indicating a new song is starting overwrites the mile per hour indicator that is already displayed on the display surface. Moreover, a subsequent warning message about the windshield washer fluid being low overwrites the message from the CD player. There is no guarantee that the most important message will be displayed long enough for the user to actually see the message.

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Neither of the current approaches described above provides an optimal solution to the problem of multiple networked devices sharing a single display device. Either the messages are inconsistently displayed, or the displayed messages quickly get too small to easily read.

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Summary of the Invention

The present invention addresses the display limitations encountered by multiple network devices attempting to display messages on a single display device. It enables multiple electronic devices connected to a network to efficiently share a single display
10 device. The messaging protocol of the present invention enables the prioritizing of incoming messages by the display device, functions over an IP based network, and provides for customizing the displayed message appearance.

In one embodiment of the present invention a method is practiced whereby a
15 network messaging protocol enables multiple electronic devices having network interfaces to share a single display device for the purpose of displaying messages. A network device utilizing the protocol which wishes to display messages on a shared display device, first sends a registration request to the display device. The display device, running the server side of the protocol, responds with an acknowledgment and an
20 ID number for that particular network device. The display device also creates a message queue tied to the just assigned network device ID number which will be used to store incoming messages from the network device. Incoming messages from registered network devices arriving at the display device are stored in the appropriate device message queue. Both the network device itself and the individual messages within a
25 queue are assigned separate priority levels. The display device executes a scheduling algorithm whereby the device with the highest priority gets its messages displayed first. The incoming messages are further sorted by priority within the message queue for the individual device. That is, messages coming from the same device may have different priority levels and those with the highest priority level will be displayed first regardless
30 of when in time they arrived at the display device message queue. The protocol further enables the dequeuing (removal) of a message from a particular device queue, the ability for a device to list all of the messages currently stored in its device queue, and

provides for the unregistering of the device when the device is done accessing the display.

5 In an alternative embodiment of the present invention, the network environment used by the present invention is located within a motor vehicle. The networked devices sending messages to the display device are electronic devices connected to the motor vehicle network, such as a CD player, stereo, global positioning satellite receiver, etc.. The protocol functions exactly the same for a motor vehicle network as it does for networks which are not located in a motor vehicle. Those skilled in the art will recognize
10 that the electronic devices listed above as part of the motor vehicle network are listed for illustration purposes and are not a definitive list of the electronic devices that may be attached to the motor vehicle network.

Brief Description of the Drawings

15 Figure 1 is a block diagram of the illustrative embodiment of the present invention being implemented by four network devices and a display device;

Figure 2 is a block diagram of the message header packet utilized in the present invention;

20 Figure 3A is a flow chart depicting the steps followed by the illustrative embodiment of the present invention during a device registration request message;

Figure 3B is a block diagram that shows the format utilized in the body of the message packet during a network device registration request message and display device response to a registration request message;

25 Figure 4A is a flow chart depicting the steps followed by the illustrative embodiment of the present invention during a device's queue request message;

Figure 4B is a block diagram that shows the format utilized in the body of the message packet during a network device's queue request message and display device response to a queue request message;

30 Figure 5A is a flow chart depicting the steps followed by the illustrative embodiment of the present invention during a device's dequeue request message;

Figure 5B is a block diagram that shows the format utilized in the body of the message packet during a network device's dequeue request message and display device response to a dequeue request message;

Figure 6A is a flow chart depicting the steps followed by the illustrative embodiment of the present invention during a device's list message request message;

Figure 6B is a block diagram that shows the format utilized in the body of the message packet during a network device's list message request message and display
5 device response to a list message request message;

Figure 7A is a flow chart depicting the steps followed by the illustrative embodiment of the present invention during a device's status request message;

Figure 7B is a block diagram that shows the format utilized in the body of the message packet during a network device's status request message and display device
10 response to a status request message;

Figure 8A is a flow chart depicting the steps followed by the illustrative embodiment of the present invention during a device's unregister request message; and

Figure 8B is a block diagram that shows the format utilized in the body of the message packet during a network device's unregister request message and display device
15 response to an unregister request message.

Detailed Description of the Invention

The illustrated embodiment of the present invention provides a network messaging protocol enabling messages from multiple network devices to share a single
20 display device. The protocol enables a display device to prioritize amongst incoming messages from different devices and to prioritize amongst incoming multiple messages from a single device. The protocol further enables multiple networked devices communicating over an IP based network to share a display device, and also provides the ability for a network device to specify the display characteristics of its message. A
25 display device executing the messaging protocol of the present invention processes and displays multiple messages from multiple network devices without the need to overwrite important messages or display messages in unreadable sizes, unlike conventional display devices.

30 Figure 1 depicts an environment suitable for practicing the illustrated embodiment. The environment includes a network 2 to which a display device 4, a first network device 6, a second network device 8, a third network device 10, and a fourth

network device 12 are interfaced. The display device 4 has a separate message queue 14, 16, 18 and 20 for each of the network devices 6, 8, 10 and 12. The network devices 6, 8, 10 and 12 have registered with the display device in accordance with the network messaging protocol, as will be described in more detail below. Thus the display device 4 has a first device message queue 14, a second device message queue 16, a third device message queue 18, and a fourth device message queue 20. The message queues function as holding areas for messages waiting to be displayed. The criteria for displaying messages waiting in the various message queues is more fully set forth below.

The network messaging protocol follows a basic request-response model, where the network device executing the client side of the protocol makes a request by sending a message to the display device, and the display device executing the server side of the protocol responds to the request with its own message back to the network device.

Figure 2 depicts a packet header 21 utilized by the protocol. The packet header precedes the body of each message sent in the protocol. The priority messaging protocol header includes a version field 22 containing a software release version number, an operations code field 24 containing the protocol code for the particular protocol function indicated by the message, a length field 26 indicating the total length of the remaining packet, and an application ID field (device ID) 28 which is assigned by the display device.

In the network messaging protocol a client may issue a number of different types of requests, these requests include a Registration request, a Queue Message request, a Dequeue Message request, a List Messages request, a Status request, and an Unregister request. These requests will be described in more detail below. Each of these different types of requests has a different operation code that will appear in the packet header prior to the body of the request messages. For each of the requests, there is a corresponding response from the display device. Each response has a different opcode that will appear in the packet header prior to the response message.

A first type of client side request is a Registration request. When a network device wishes to use a shared display device, the network device first must register with the display device. Registration is accomplished through a request as set forth in the

protocol. The header for the request indicates through the opcode that the packet following the header is part of the registration request. Because the device has not yet registered, the application ID is set to zero. The registration process is depicted in Figure 3A. A network device 30 sends a Registration request 32 to the display device 34. The Registration request 32 includes both the device name and the facility code identifying the location of the network device 30. The display device 34 upon receiving the registration request 32 assigns an application /device ID number to the network device, and sends an acknowledgment 36 back to the network device 30. The network device 30 uses the application/device ID in all further communications with the display device.

The frame format for the Registration request is depicted in Figure 3B. The body of the Registration request 38 includes fields for a facility code 40, and a length field 42, which indicates the length of the name field 44 immediately following the length field. The display device 34 responds to the request with a response message in which the header indicates a response to a Registration request follows. The header's application/device ID field is set to the just assigned number of the network device registering, and the body of the response 46 includes an acknowledgment field (ACK) 48 which indicates the registration was successfully completed. In the event the registration is not successfully completed, the acknowledgement field 48 contains an error code.

Once the network device 30 has successfully registered with the display device, it is then able send messages to the display device for display. Messages are sent to the display device using a Queue Message request. As depicted in Figure 4A, a network device 30 sends a Queue Message request 52 to a display device 34. The Queue Message request 52 includes the application/device ID identifying the registered device, a priority level for the message (i.e.: priority flags), and additional information indicating how the message is to be displayed by the display device along with the message payload. The display device 34 responds with a Queue Message 56 which includes an acknowledgment or error message and, in the event of a successful completion of the operation, the message ID that was assigned to the new message. The

display device uses the message ID to identify particular messages stored in a priority message queue.

The details of the queue message request frame format are depicted in Figure 4B.

- 5 The body of the Queue Message request 58 includes a priority field 60, which indicates the priority of the message, a type flag field 62, which indicates whether the message is a text message, an image message or both, a feature flag field 64, which indicates whether the display surface should first be cleared, whether the message should scroll either horizontally or vertically, and whether the message should be persistent. The
- 10 Queue Message request 58 further includes a delay field 66 indicating how long the message should be displayed and a text length field indicating the number of bytes in the text string being sent. A text message field 70, contains the actual message bytes. An optional image length field 72, may be included to indicate the number of bytes in the image message, and an optional image field 74 containing the actual image bytes in the
- 15 message may be provided. The body of the Queue Message response 78 includes fields for an Acknowledgement 79 and a Message ID 80 that is assigned by the display device to the message accompanying the message request. The actual message itself is placed in a priority message queue dedicated to messages received from the registered network device and indexed via the Message ID 80.

20

In an alternate embodiment, the extensible markup language (XML) may be used in the present invention. If XML is used for the priority messaging protocol, the exact structure of the message will be defined within an XML string.

- 25 The display device runs a scheduling algorithm to determine which messages are displayed. The algorithm first searches to find out which registered network device has been assigned the highest device priority. In the event that the network device with the highest device priority has messages waiting for display in its priority queue, the display devices selects a message from the queue. The message selection from within a queue is
- 30 also priority based. The display device 34 retrieves the message with the highest priority from the queue and displays it on the screen. The length of time and the manner in which the message is displayed is dictated either by the display characteristics specified

in the message sent by the network device 30, or by the default parameters of the display device 34 if the message does not contain any requested display characteristics.

5 The illustrative embodiment of the present invention also includes a Dequeue request. The Dequeue request removes a previously sent message from the message queue of the requesting device. The sequence of steps followed by a network device attempting to dequeue a message in the illustrated embodiment of the present invention are depicted in Figure 5A. A network device 30 sends a Dequeue Message request 84 which includes both a device ID identifying the network device, and a message ID
10 identifying the message the network device wishes to remove from its queue. The display device 34, upon receiving the Dequeue Message request 84, attempts to dequeue the message and sends a Dequeue Message response 88 which includes either an acknowledgment or an error message along with a return message ID identifying the message that was removed from the queue in the event the operation was successful.

15 Figure 5B depicts the body of the Dequeue Message request 90. It includes a message ID field 92 identifying the particular message which the network device wishes to remove from its queue. The body of the response message 94 includes an acknowledgment field 96 and a message ID 98 indicating the message that was removed
20 from the queue. In the event the message was successfully removed, the acknowledgement field contains the number 0 and the message ID contains the message ID of the removed message. Conversely, if an error removing the message was encountered, the acknowledgement field will contain a non-zero number equating to a defined error message and the message ID field will be set to zero indicating no message
25 was removed.

The illustrated embodiment of the present invention also enables a network device to request a list of all the message ID's in the priority message queue for that device. The sequence of events illustrating this List Message request is depicted in
30 Figure 6A. A network device 30 sends a List Message request 102 containing the application/device ID to a display device 34. The display device 34 sends the List Message response 106 back to the network device 30. The List Message response 106

includes an acknowledgment and a return list of all of the message ID's in the network device's priority queue, or else the List Message response contains an error message.

Figure 6B depicts the frame format used in the body of the List Message request and the body of the corresponding List Message response. The actual body of the List Message request is empty as the header contains both the operation code and the device ID which is all the information required for the request. The body of the response to the List Message request 110 includes an acknowledgment field, a length field indicating the length of the rest of the response 114, and message ID fields 116, 120, 122 corresponding for message ID's one to N.

The illustrative embodiment of the present invention provides a network device 30 with the capability to request the status of a particular message in its priority message queue. Figure 7A depicts the sequence of events by which a network device 30 requests the status of a particular message in its priority message queue. A network device 30 sends a status request 126 which includes an application ID and the message ID whose status is requested. The display device 34 upon receiving the request sends a status request response 130 which includes an acknowledgment and a status information.

Figure 7B depicts the message body of the status request 132 which consists solely of the message ID 134 field, as the message header op code indicates the message was a status request. The message body of the status request response 136 includes an acknowledgment field 138, a priority field 140, indicating the messages priority, a type flag field 142 indicating the type of message text image or both, a feature flag field 144 indicating the display features associated with the message, and a delay field 146 indicating the length and time the message is to be displayed. This information provides a snapshot of how the display device recorded the message in the priority queue.

The illustrated embodiment of the present invention also includes an Unregister request to be performed by a network device when it is done accessing the display device. Figure 8A depicts the steps of the Unregister request. A network device 30 sends an Unregister request 150 accompanied by the device ID previously assigned to the network device. The display device 34 sends an Unregister request response 154

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We Claim:

- 5 1. A method for displaying messages on a display device, said messages originating from a plurality of networked electronic devices interfaced with a network, said method comprising the steps of:
- providing a protocol to enable multiple networked devices to send messages to a display device,
- 10 enabling said display device to receive said messages; and
- enabling said display device to prioritize the display of received messages.
2. The method of claim 1 wherein the network is an Internet Protocol (IP) based network.
- 15 3. The method of claim 1 wherein said method further comprises the step of:
- registering a selected one of said networked electronic devices with said display device, prior to said display device displaying any messages from said selected networked electronic device.
- 20 4. The method of claim 3 wherein a plurality of networked electronic devices register with said display device.
5. The method of claim 3 wherein said registering further comprises:
- 25 sending to the display device a text string representing a device name for the selected networked electronic device.
6. The method of claim 3 wherein said method further comprises the step of:
- 30 sending to the display device a graphical image representing the selected networked electronic device.

7. The method of claim 4, said method comprising the additional steps of:
creating a separate priority message queue on the display device for each
networked electronic device that is registered with the display device;
assigning a priority level to each priority message queue;
5 receiving a display message at the display device from a given one of the
networked electronic devices; and
placing the received display message in the priority message queue for the given
networked electronic device.
- 10 8. The method of claim 7 wherein said received display message in the message queue
for the given networked electronic device contains text.
9. The method of claim 7 wherein said received display message in the message queue
for the given networked electronic device contains a graphical image.
- 15 10. The method of claim 7 wherein said received display message in the message queue
for the given networked electronic device contains both text and a graphical image.
11. The method of claim 7, said method comprising the additional steps of:
20 providing a priority level for each display message sent from the given
networked electronic device to the display device; and
creating a unique message ID identifying each message placed in said priority
message queue of said given networked electronic device.
- 25 12. The method of claim 11, said method comprising the additional steps of:
selecting a highest priority message queue among the priority message queues,
said priority message queue containing at least one message;
selecting from within said highest priority message queue a message with the
highest message priority level; and
30 displaying said selected message on said display device.

13. The method of claim 7, said method comprising the additional step of:

 sending a request to said display device from a registered networked electronic device that is registered with the display device to remove a message from the priority message queue of said registered networked electronic device.

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14. The method of claim 7, said method comprising the additional step of:

 sending a list of Message IDs appearing in a priority message queue from said display device to a particular networked electronic device registered with said display device in response to a request from said particular networked electronic device.

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15. The method of claim 7, said method comprising the additional step of:

 sending a status message providing a current status of a message in a priority message queue from said display device to a registered networked electronic device registered with said display device in response to a request from said registered networked electronic device.

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16. The method of claim 7, said method comprising the additional step of:

 including display instructions as part of the display message sent to said display device by the given networked electronic device registered with said display device.

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17. The method of claim 7, said method comprising the additional step of:

 unregistering said given networked electronic device registered with said display device.

25 18. The method of claim 1 wherein said messages are written using the using the extensible markup language (XML).

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19. A method for displaying messages on a display device, said messages originating from a plurality of networked electronic devices, said networked electronic devices interfaced with a network located in a motor vehicle, said method comprising the steps of:

- 5 providing a protocol to enable multiple networked devices to send messages to a display device;
 enabling said display device to receive said messages; and
 enabling said display device to prioritize the display of said received messages.

- 10 20. The method of claim 19 wherein said method further comprises the step of:
 registering a selected one of said networked electronic devices with said display device, prior to said display device displaying any messages from said selected networked electronic device, and

- sending a text string representing a device name to the display device from the
15 selected networked electronic device as part of said registration.

21. The method of claim 20 wherein said method further comprises the step of:
 sending to the display device a graphical image representing the selected networked electronic device.

- 20 22. The method of claim 20 wherein a plurality of networked electronic devices register with said display device.

23. The method of claim 20, said method comprising the additional steps of:

- 25 creating a separate priority message queue on the display device for each networked electronic device that is registered with the display device;

 assigning a priority level to each priority message queue;

 receiving a display message at the display device from a given one of the networked electronic devices; and

- 30 placing the received display message in the priority message queue for the given networked electronic device.

24. The method of claim 23 wherein said received display message in the message queue for the given networked electronic device contains text.

25. The method of claim 23 wherein said received display message in the message
5 queue for the given networked electronic device contains a graphical image.

26. The method of claim 23 wherein said received display message in the message queue for the given networked electronic device contains both text and a graphical image.

10 27. The method of claim 23, said method comprising the additional steps of:
providing a priority level for each display message sent from the given
networked electronic device to the display device; and
creating a unique message ID identifying each message placed in said priority
message queue of said given networked electronic device.

15 28. The method of claim 27, said method comprising the additional steps of:
selecting a highest priority message queue among the priority message queues,
said priority message queue containing at least one message;
selecting from within said highest priority message queue a message with the
20 highest message priority level; and
displaying said selected message on said display device.

29. The method of claim 23, said method comprising the additional step of:
sending a request to said display device from a registered networked electronic
25 device that is registered with the display device to remove a message from the priority
message queue of said registered networked electronic device.

30. The method of claim 23, said method comprising the additional step of:
sending a list of Message Ids appearing in a priority message queue from said
30 display device to a particular networked electronic device registered with said display
device in response to a request from said particular networked electronic device.

31. The method of claim 23, said method comprising the additional step of:

5 sending a status message providing a current status of a message in a priority message queue from said display device to a registered networked electronic device registered with said display device in response to a request from said registered networked electronic device.

32. The method of claim 23, said method comprising the additional step of:

10 including display instructions as part of the display message sent to said display device by the given networked electronic device registered with said display device.

33. The method of claim 23, said method comprising the additional step of:

15 unregistering said given networked electronic device registered with said display device.

34. The method of claim 19 wherein said messages are written using the using the extensible markup language (XML).

20 35. A medium for use with a display device with a network interface, said medium holding computer – executable instructions for a method, said method comprising the steps of:

providing a protocol to enable multiple networked devices to send messages to a display device, and

25 enabling said display device to receive said messages; and

enabling said display device to prioritize the display of received messages.

36. The medium of claim 35 wherein said network is an Internet Protocol (IP) based network.

ABSTRACT

5 A network messaging protocol enabling messages from multiple network devices
to share a single display device is disclosed. The protocol enables a display device to
prioritize among incoming messages from different network devices and to prioritize
among incoming multiple messages from a single device. The protocol further enables
multiple networked devices communicating over an IP based network to share a display
device, and also provides the ability for a network device to specify the display
characteristics of its message. A display device executing the messaging protocol
10 processes and displays multiple messages from multiple network devices without the
need to overwrite important messages or display messages in unreadable sizes.

0970479-110400

Figure 1

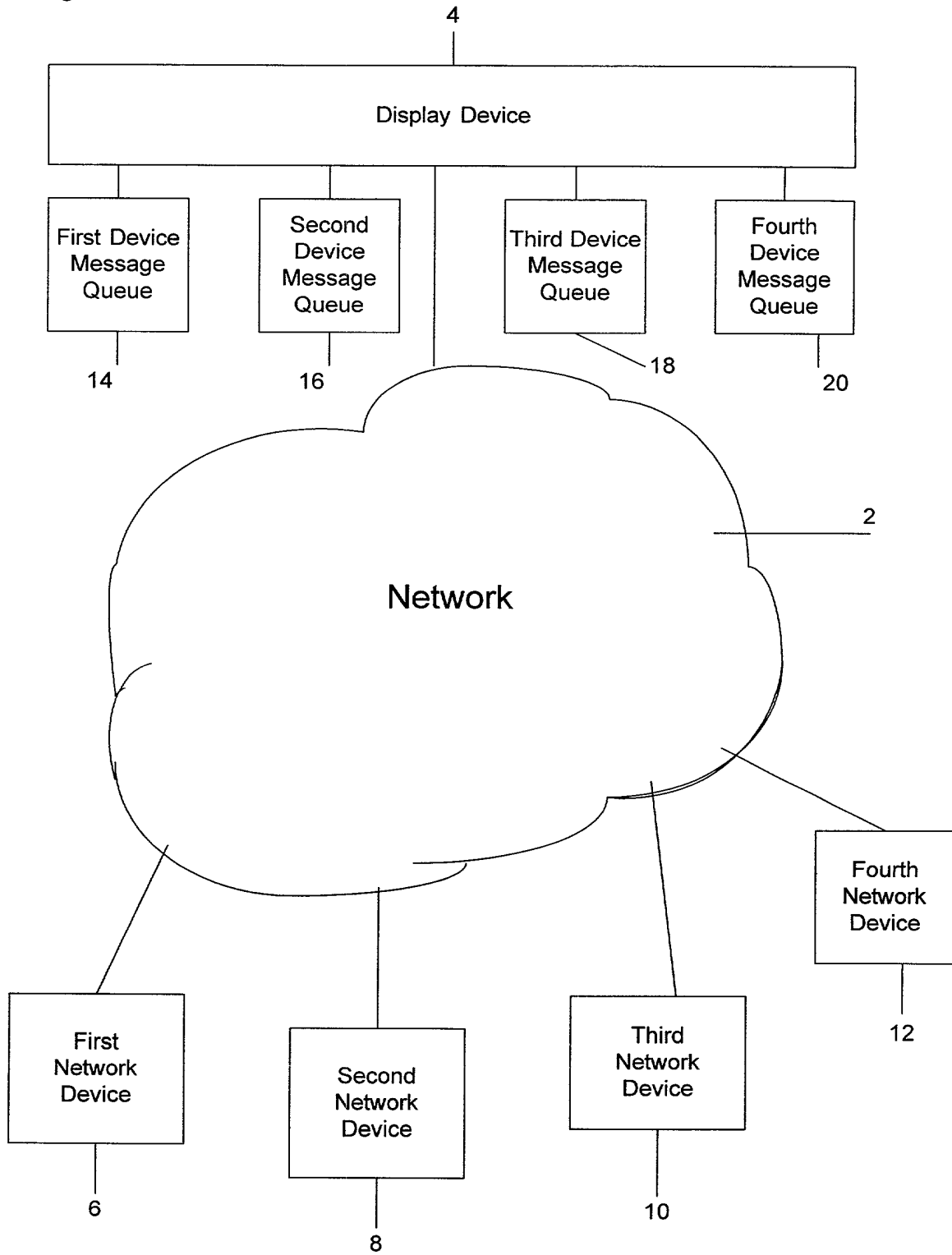
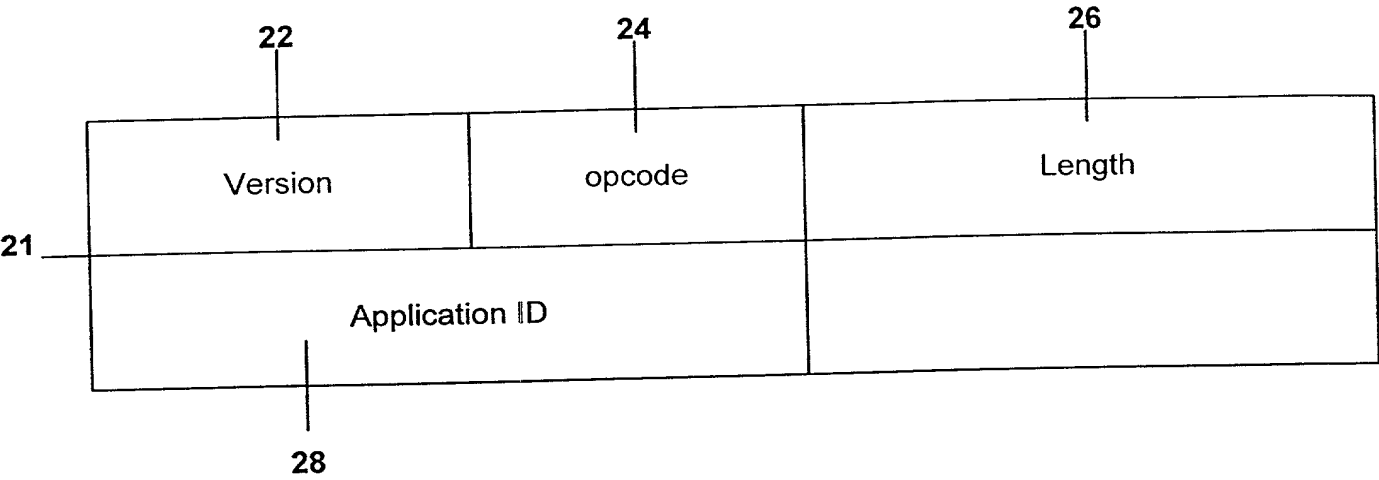
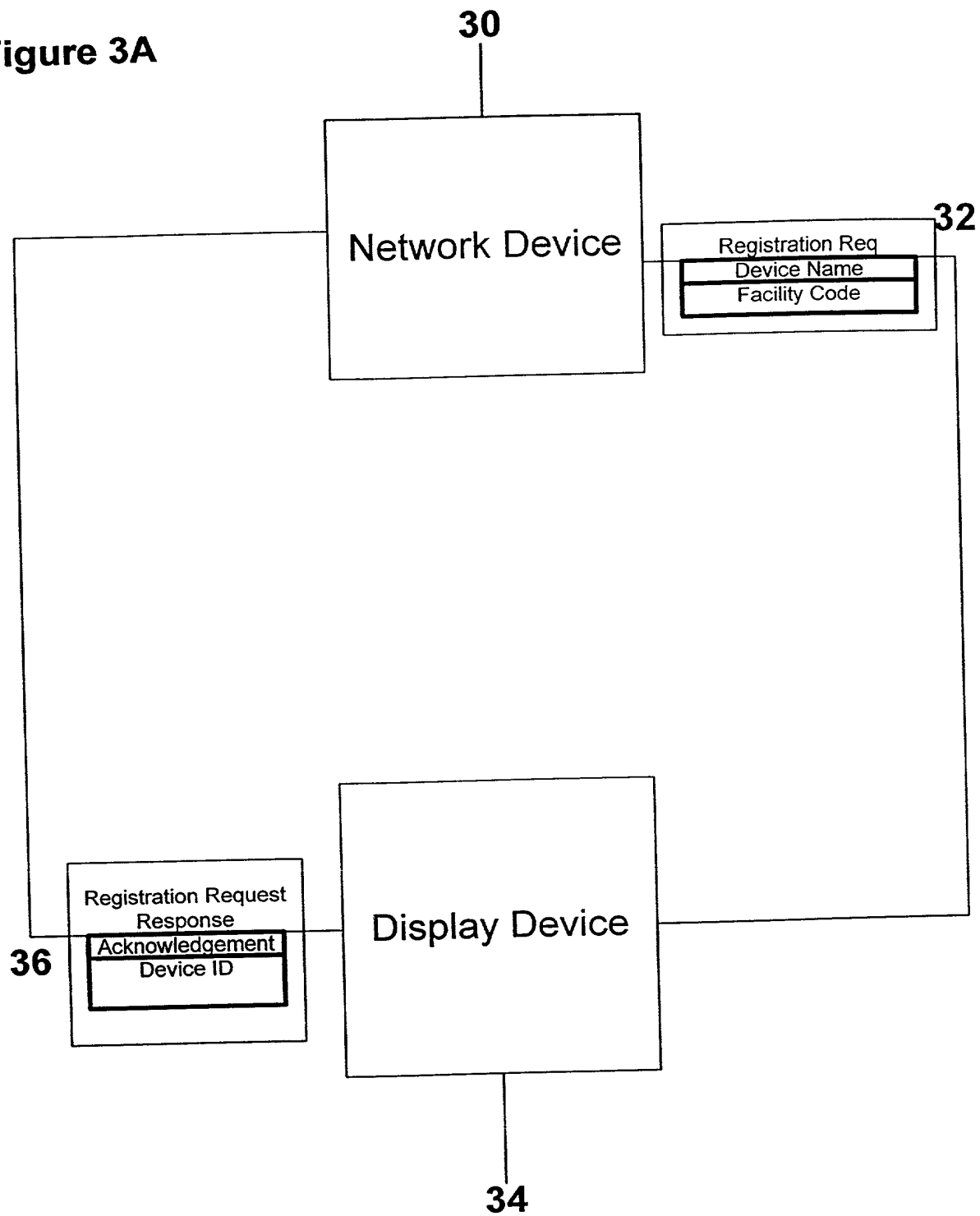


Figure 2



00000000000000000000000000000000

Figure 3A



1990-1991		1991-1992		1992-1993		1993-1994		1994-1995		1995-1996		1996-1997		1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2216-2217	
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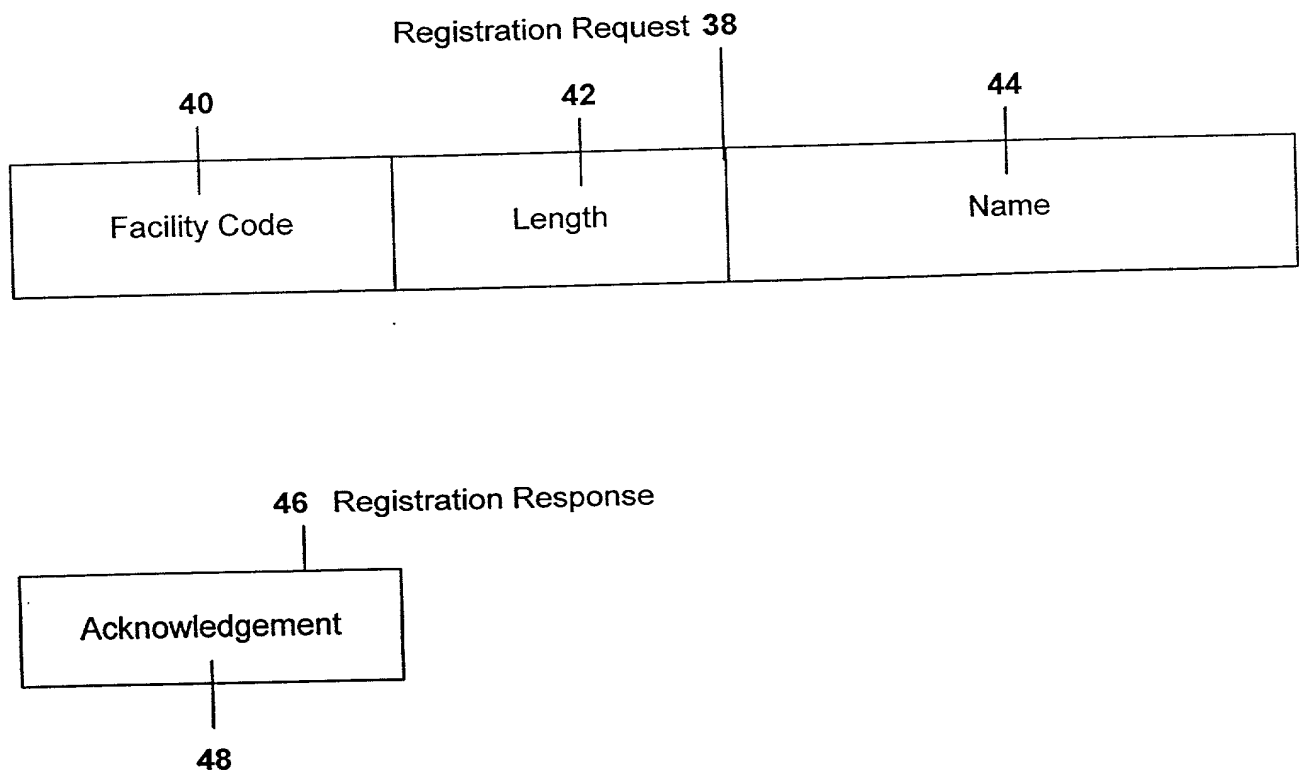
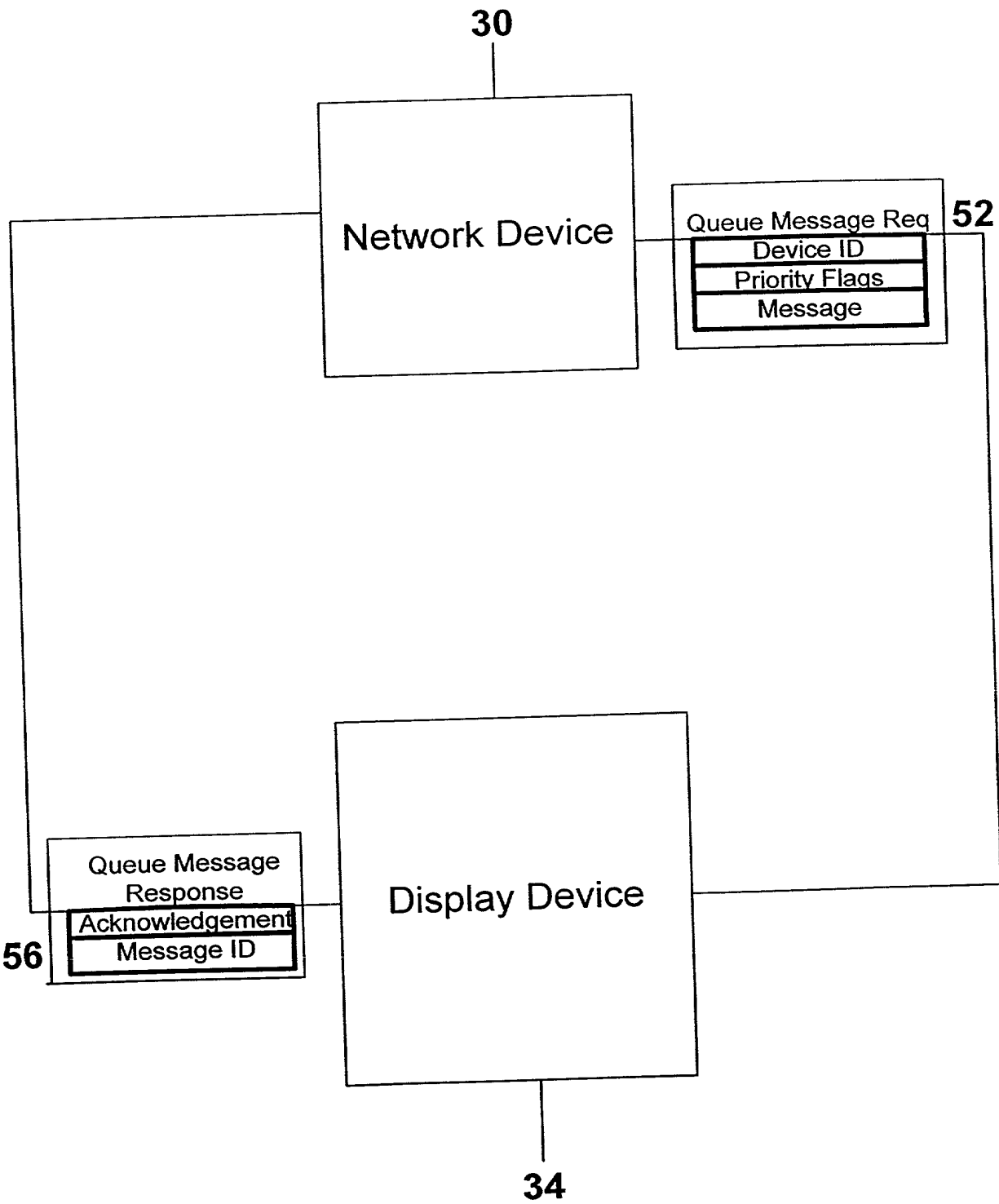


Figure 4A



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Figure 1 consists of 11 sub-graphs labeled (a) through (k). Each graph plots the percentage of total protein (Y-axis, 0 to 100) against time in hours (X-axis, 0 to 24). The graphs show the distribution of protein fractions (A, B, C, D, E, F, G, H, I, J, K) over time for different treatments (Control, 100 μ g/kg, 200 μ g/kg, 400 μ g/kg, 800 μ g/kg, 1600 μ g/kg, 3200 μ g/kg, 6400 μ g/kg, 12800 μ g/kg, 25600 μ g/kg, 51200 μ g/kg). The graphs show the distribution of protein fractions over time for each treatment group.



Figure 5A

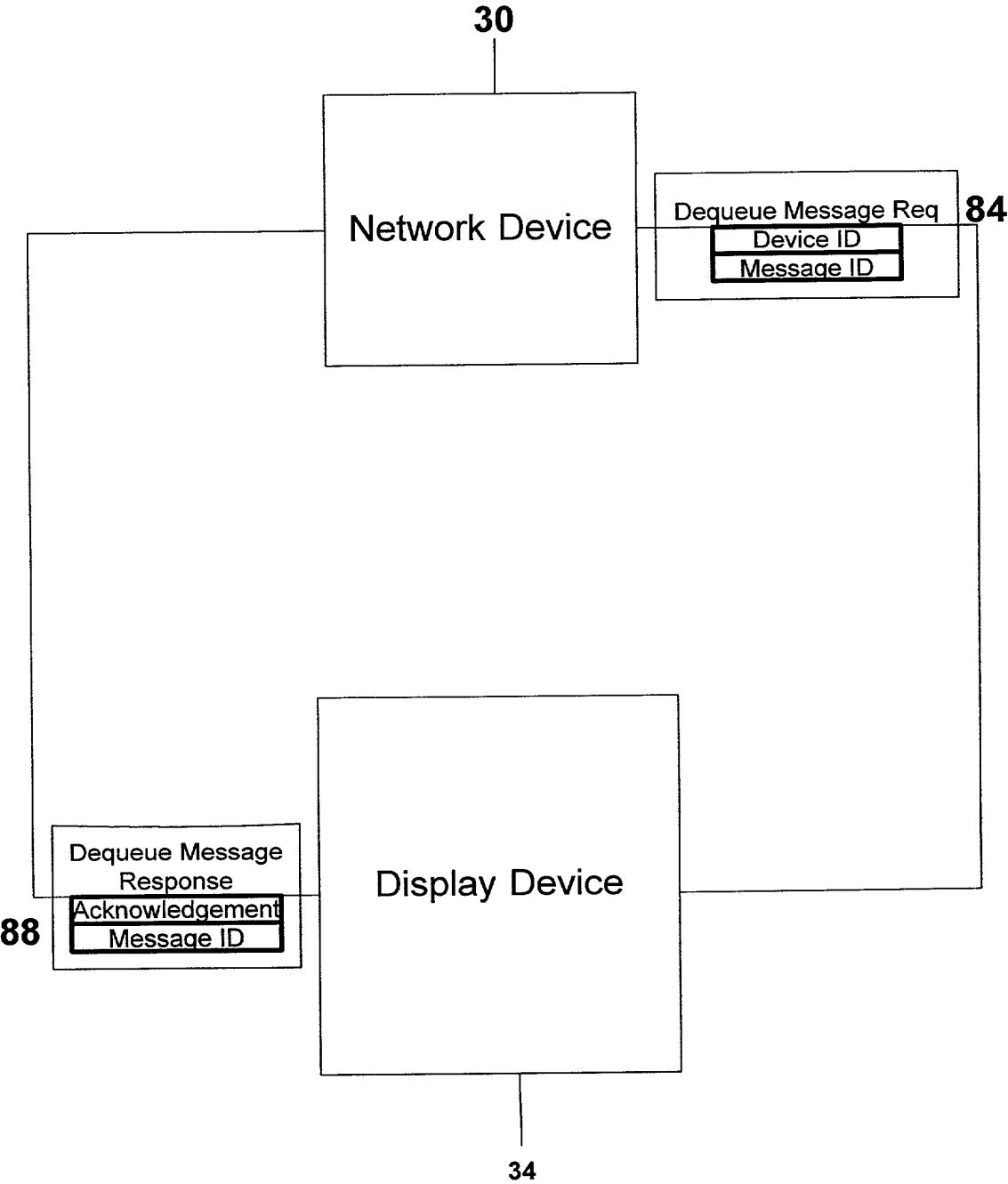


Figure 5B

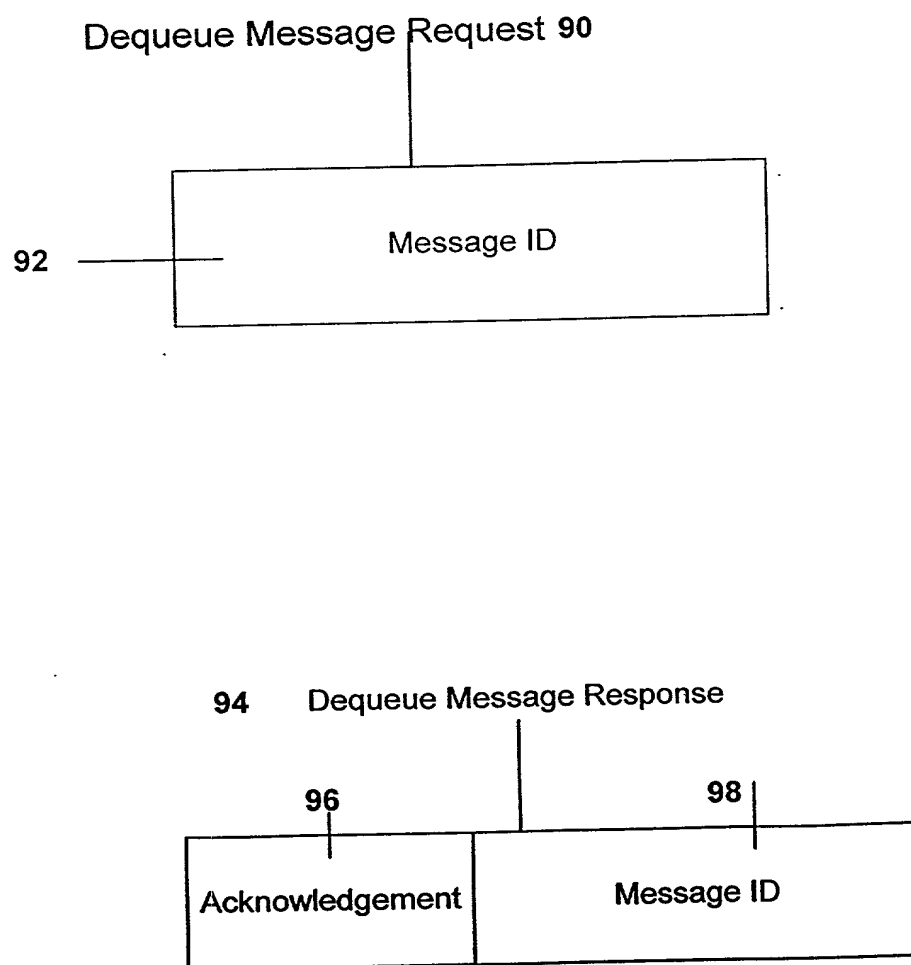


Figure 6A

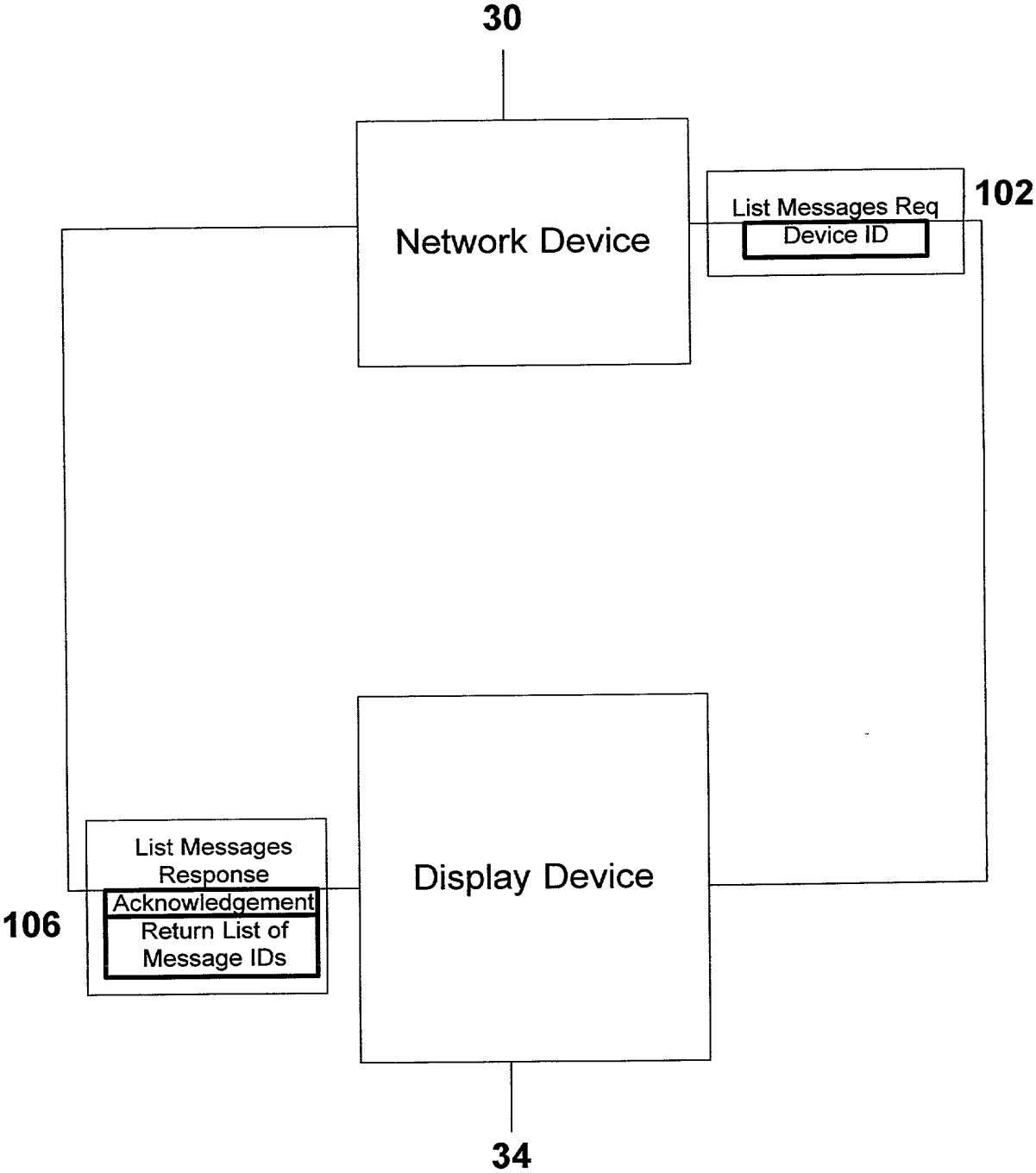


Figure 6B

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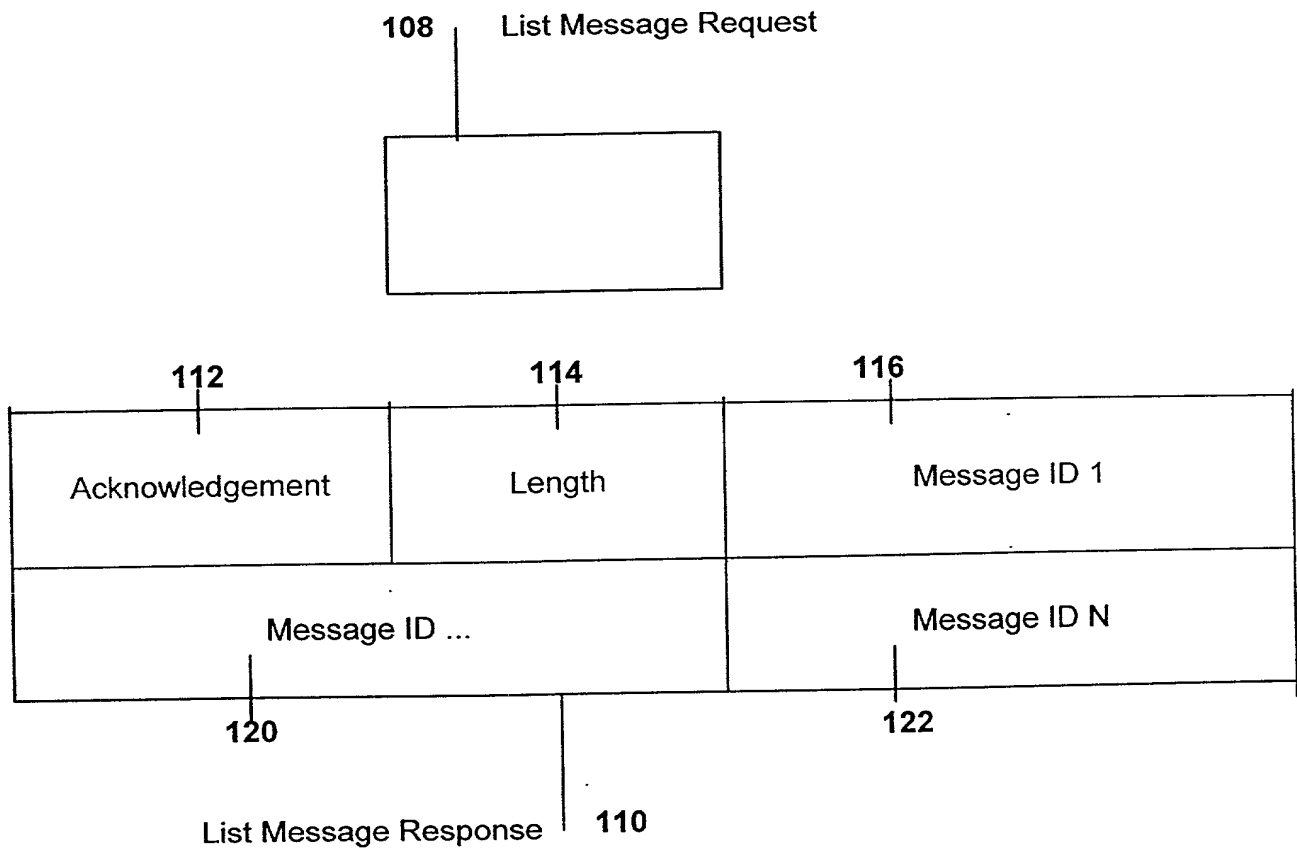


Figure 7A

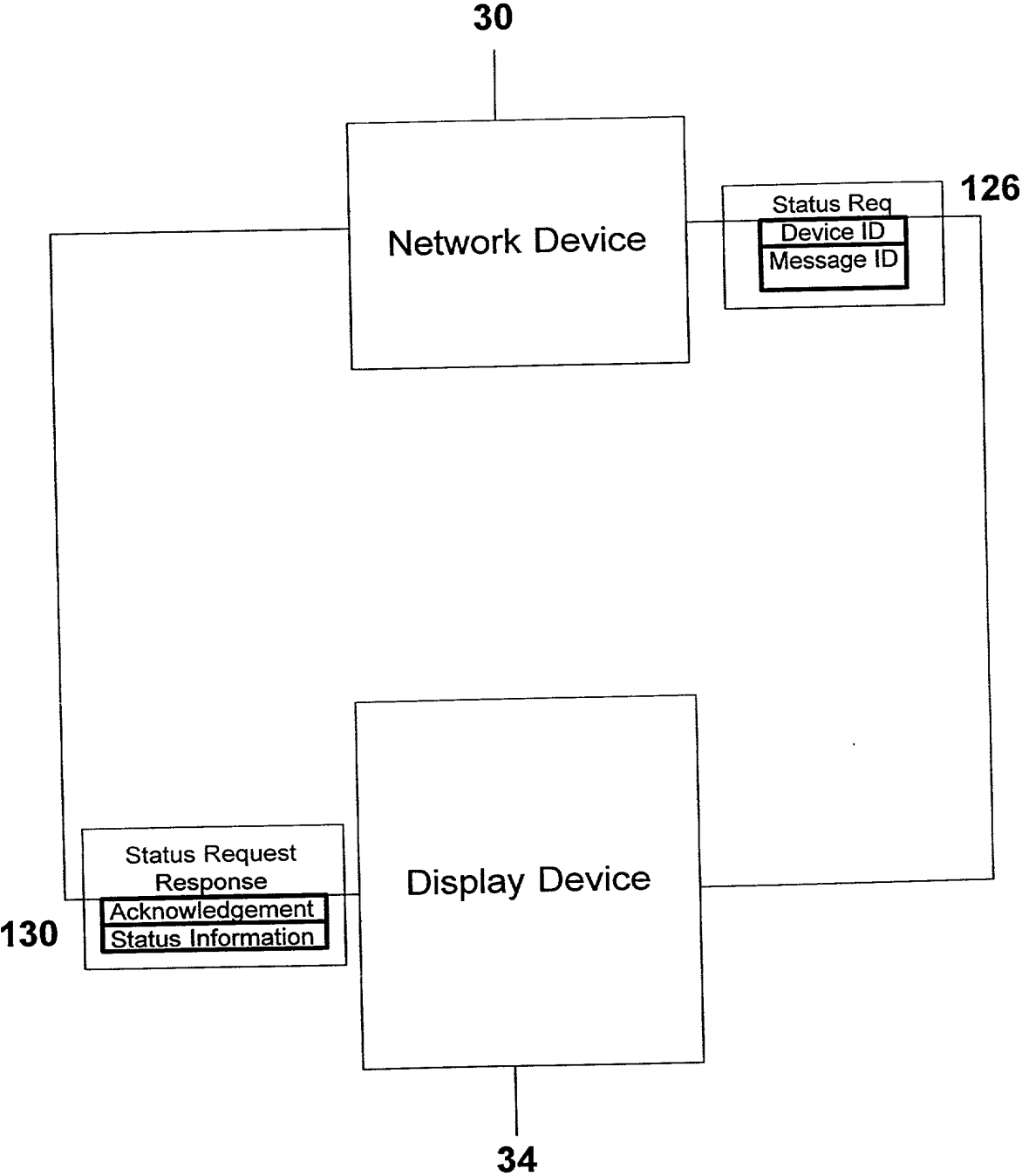


Figure 7B

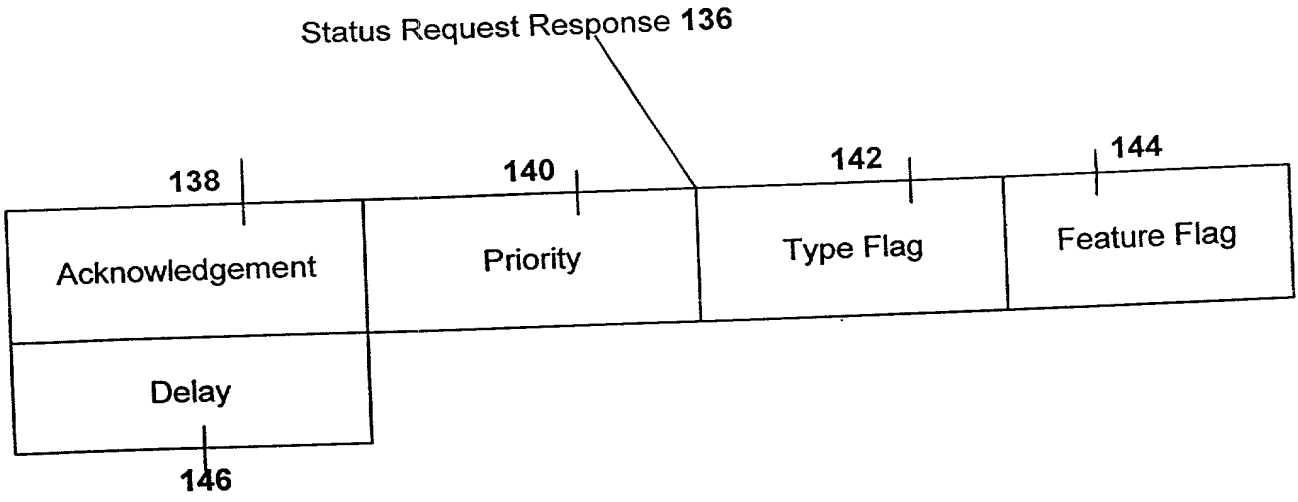
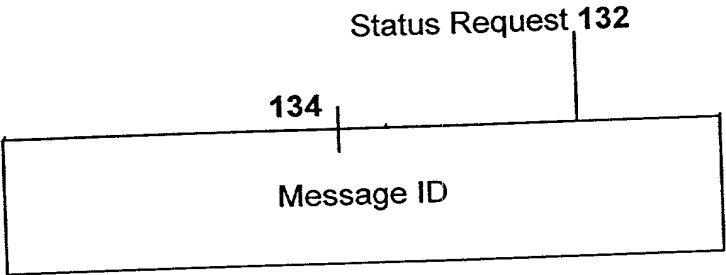


Figure 8A

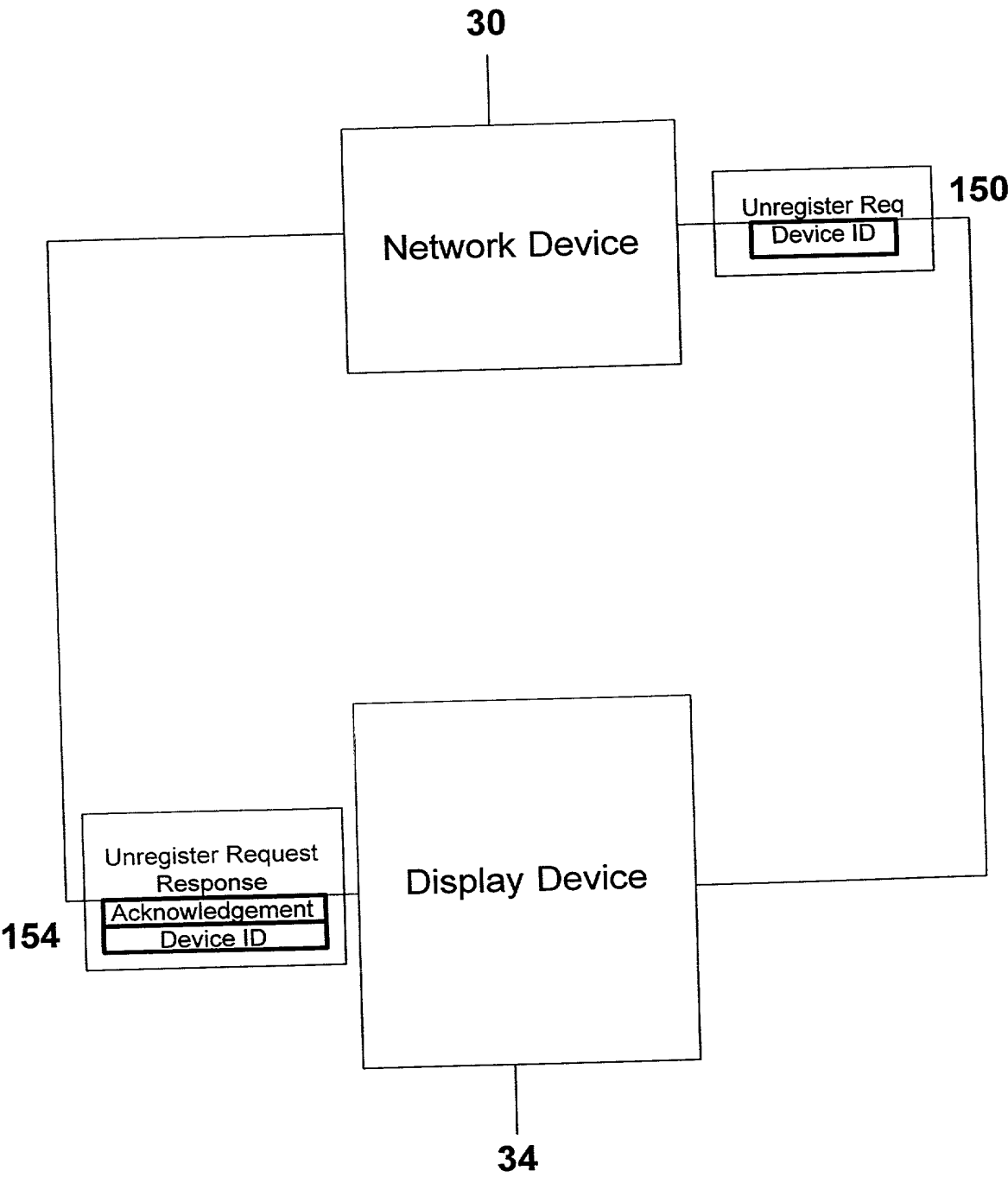
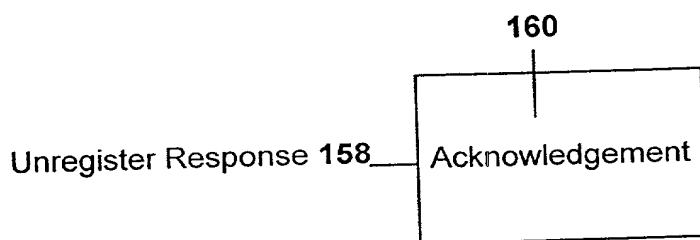
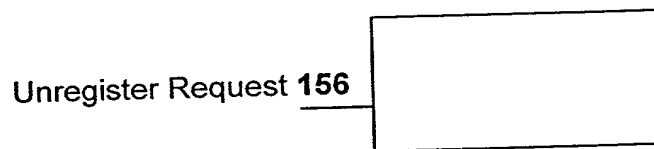


Figure 8B



00T0T 624060

Customer Number: 000959

Attorney's

Docket

Number SMQ-038

(P5129/RSH)

Declaration, Petition and Power of Attorney for Patent Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**SYSTEM AND METHOD FOR A PRIORITY MESSAGING
PROTOCOL FOR A SHARED DISPLAY DEVICE**

the specification of which

(check one)

X is attached hereto.

 was filed on _____ as

Application Serial No. _____

and was amended on _____
(if applicable)

I do not know and do not believe that the subject matter of this application was known or used by others in the United States or patented or described in a printed publication in any country before my invention thereof, or patented or described in a printed publication in any country or in public use or on sale in the United States more than one year prior to the date of this application, or first patented or caused to be patented or made the subject of an inventor's certificate by me or my legal representatives or assigns in a country foreign to the United States prior to the date of this application on an application filed more than twelve months (six months if this application is for a design) before the filing of this application; and I acknowledge my duty to disclose information of which I am aware which is material to the examination of this application, that no application for patent or inventor's certificate on the subject matter of this application has been filed by me or my representatives or assigns in any country foreign to the United States, except those identified below, and that I have reviewed and understand the contents of the specification, including the claims as amended by any amendment referred to herein.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

0970479-110100

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Check one:

☒ no such applications have been filed.

☐ such applications have been filed as follows

EARLIEST FOREIGN APPLICATION(S), IF ANY, FILED WITHIN 12 MONTHS
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

Country	Application Number	Date of Filing (month,day,year)	Priority Claimed Under 35 USC 119
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS
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(Filing Date)

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I hereby claim the benefit under Title 35, United States Code, §120 of any earlier United States application(s) or PCT international application(s) designating the United States listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the earlier application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date(s) of the earlier application(s) and the national or PCT international filing date of this application. As to subject matter of this application which is common to my earlier application(s), if any, described below, I do not know and do not believe that the same was known or used by others in the United States or patented or described in a printed publication in any country before my invention thereof, or patented or described in a printed publication in any country or in public use or on sale in the United States more than one year prior to the date(s) of said earlier application(s), or first patented or caused to be patented or made the subject of an inventor's certificate by me or my legal representatives or assigns in a country foreign to the United States prior to the date(s) of said earlier application(s) on an application filed more than twelve months (six months if this application is for a design) before the filing of said earlier application(s); and I acknowledge that no application for patent or inventor's certificate on said subject matter has been filed by me or my representatives or assigns in any country foreign to the United States except those identified herein.

_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status) (patented,pending,aband.)
_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status) (patented,pending,aband.)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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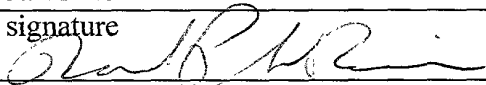
Lahive & Cockfield, LLP, 28 State Street, Boston, MA 02109

Direct Telephone Calls to: (name and telephone number)

Kevin J. Canning, Esq., (617) 227-7400

Wherefore I petition that letters patent be granted to me for the invention or discovery described and claimed in the attached specification and claims, and hereby subscribe my name to said specification and claims and to the foregoing declaration, power of attorney, and this petition.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's signature	Date
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United States	
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Same as Above	
Full name of second inventor, if any	
Inventor's signature	
Date	
Residence	
Citizenship	
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